

## Run 2b TDR

- AAC Review is Dec. 11-12
- Give final document to committee Dec. 1
- 1<sup>st</sup> draft should be done by Nov. 1
- Outline of Sections
  - Goal/Potential
  - Machine physics
  - Technical
  - Project Plan
    - State succinctly what is in the plan. Discuss how long to complete the whole project.
    - Current status what has been done as of end of FY2001
    - FY2002 Plans
    - This should match to the current manpower and dollar plans.
    - It would be interesting to be explicit about what is the limiting factor/... physicists, engineers, beam time, dollars or whatever.
    - FY2003 Plans
  - Summary

# Slip Stacking

- Goal/Potential
  - discuss that the current  $5 \times 10^{12}$  represents a limit.
  - Introduce the idea that slip stacking, with the cartoon, could offer of order a factor 2.
  - Discuss that for pbar production this has modest increase in cycle time.
- Machine physics
  - theory/simulations
    - A review of the low intensity simulation results (Shukla) There should be a summary table and/or plots of relevant parameters such as:
      - Energy Separation, Bucket Area, MI momentum acceptance, Slipping speed, Synch Frequency, Long. Emittance dilution, etc..
    - The Debuncher Bunch rotation efficiency plot as a function of bunch length on target.
      - need to tie together the bunch length on target as a function of long. emittance.
  - previous experience MR + now MI
  - alternative approaches... eg the barrier rf approach
  - Beam Instabilities
    - If we are going to double the amount of charge in the MI (not to mention NUMI), we should have some discussion about longitudinal and transverse instabilities and dampers. Presently, The MI does not have any damping system that could cope with possible high bandwidth instabilities.

# Slip Stacking

- Technical
  - A time based flow chart of the whole process including NUMI batches.
  - A block diagram of the low level RF system with the slip stacking modules included.
  - Beam loading Compensation
    - Intensity scaling arguments that dictated the specs on the beam loading compensation.
    - Slip Stacking simulations with just the fundamental compensated at various gain levels.
    - Slip Stacking simulations with the fundamental compensated and various mode lines compensated at various gain levels
    - Hi Level RF specs.
      - i.e. how much plate current can the tubes source. The dynamic range of the system. The bandwidth of the tuning loops. etc.
    - A direct RF feedback block diagram including the fundamental and transient compensation
    - A discussion about the Nyquist stability as a function of gain of the system.
    - A feed-forward block diagram with a discussion about the Nyquist stability as well.

## AP2 and Debuncher Aperture

- Goal/Potential
  - Discussion of the TEV 1 yield vs. aperture plot.
  - Discussion of the present collection system
    - from the lens to/and including the Debuncher,
    - the injection channel
  - Include Debuncher Lattice Upgrades
- Machine Physics
  - A discussion of the measured aperture in BOTH AP2 and the Debuncher vs the list of physical apertures. A large discrepancy between the measured aperture and the available aperture should make a strong case for alignment.
    - Need a table of all the physical apertures in AP2 and the Debuncher and the lattice parameters at each aperture.
  - New lattice design. The lattice of AP2 is not optimized as far as maximum aperture is concerned.
  - The acceptance of AP2 has serious implications for what lattice functions are needed at the lithium lens. This in turn dictates some physical restrictions on lens diameter. We need to show we have thought this through.
  - Debuncher Lattice Upgrades
    - Coupling, Harmonic Correction, gamma-t ramps

## AP2 and Debuncher Aperture

- Technical
  - A DETAILED discussion of our alignment strategies.
    - motorized quads, portable quad alignment, trims.
    - A description of a detailed study plan on how we are going to re-align the machines,
      - what we are going to measure, and how we are going to measure it.
        - » Debuncher reverse TBT, injection and extraction channel aperture measurements, lattice measurements, Quad moves, reverse injection up AP2, how to make BPM measurements in AP2 with reverse protons, how to make aperture measurements in AP2 with reverse protons
  - Justification for a reliable and accurate BPM system.
    - We should have a block diagram of the new BPM systems for both AP2 and the Debuncher.
    - We should also describe the specs. on the systems
  - Marginal physical apertures
    - (band 4 of Debuncher cooling, straight beam pipe in the arcs, adiabatic Debuncher RF cavities, DRF3, etc.)
    - Discuss which ones we are going to fix and what it will entail.
  - Description of the magnet systems needed for the Debuncher Lattice Upgrades.

# Accumulator Stochastic Cooling

- Goals/Potential
  - Description of Stochastic Stacking
    - Optimization of parameters
    - Drawbacks to parameter changes
- Machine Physics
  - Description of present system and limitations
    - Band overlap and lattice implications
    - Momentum aperture and core density
    - System instabilities
    - Transverse heating
    - Dynamic range
  - Description of new system
    - Block diagram
    - Simulation results
    - Nyquist Stability
- Technical
  - Mechanical & electrical design of new Pickups (LHe cooled?)
  - Electronic specs.
    - Noise, Dynamic range, Power level, Intermod distortion

## 8 GeV Antiproton Transfers

- Goals/Potential
  - Overview of present transfers
    - Limitations and bottlenecks
  - Transfers to recycler every 10 minutes
  - 1 minute shot setup
    - This part of TDR must convince we can really do this.
- Machine Physics
  - Description of transfer process
    - Start with long. Manipulations in Accumulator
  - Lattice Design
  - Hysteresis protocol with 120 GeV Pbar production
- Technical
  - Power supply and magnet specs.
  - Controls (ramp card etc.)
  - Pbar Damper
  - Quadrupole oscillation detectors
  - Software control
    - Sequencer type programs
    - tuning and measurement programs